Charnock Initial Regional Response Activities (CIRRA)

TASK 5
TREATMENT TECHNOLOGY PERFORMANCE REPORT
Charnock Sub-Basin
Los Angeles, California

VOLUME I
REPORT and APPENDICES A thru I

submitted to:

California Regional Water Quality Control Board
Los Angeles Region

and

U.S. Environmental Protection Agency
Region IX

on behalf of:

Shell Oil Company
Shell Oil Products Company
Equilon Enterprises LLC

prepared by:

Kennedy/Jenks Consultants
Irvine, California
K/J 004028.00

1 October 2000

Kennedy/Jenks Consultants
Engineers & Scientists

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1 INTRODUCTION

This report has been prepared by Kennedy/Jenks Consultants (Kennedy/Jenks) on behalf of Shell Oil Company (Shell), Shell Oil Products Company, and Equilon Enterprises LLC (Equilon) as required by joint agency requirements contained in Attachment A, Scope of Work (SOW), Task 5, to the Los Angeles Regional Water Quality Control Board (LA RWQCB) Stipulated Agreement No. 00-064 and the United States Environmental Protection Agency (USEPA) Administrative Order on Consent USEPA Docket No. RCRA 7003-09-2000-0003 (SA/AOC).

Task 5 is entitled "Completion of Treatability Technology Performance Report." The purpose of this task is to provide the information necessary to evaluate the ability of various treatment technologies to effectively remove Methyl *tertiary* Butyl Ether (MtBE), *tertiary* Butyl Alcohol (tBA) and other gasoline contamination constituents from contaminated groundwater. Four specific technologies were identified in the agency SOW for inclusion in this performance report: granular activated carbon (GAC), advanced oxidation process (AOP), resin adsorption, and air stripping.

This report includes data generated during the Charnock Well Field Startup LLC treatability studies, the potentially responsible party (PRP) Site 11 (Abrams Shell) studies, and other bench-scale or pilot studies conducted using Charnock Sub-Basin water. A literature review and summary of relevant information regarding the treatment of oxygenates in drinking water were also completed. Finally, preliminary mass balances were estimated for the identified technologies.

1.1 Influent Water Characterization

The influent water characteristics for the pilot tests and bench-scale studies conducted for the Charnock Sub-Basin vary depending on the source water. The following three distinct water sources were identified and included in the data presented in this report:

- City of Santa Monica (COSM) Charnock Well Field.
- COSM Arcadia Well Field.
- Upper groundwater aquifer at Abrams Shell Site 11.

Table 1 presents the water influent characteristics for the three water sources.

The concentration levels and range of constituents produced from the shallow aquifer groundwater at the Abrams Shell site differ greatly from the profile of the groundwater produced from the deeper aquifers. Generally, the Abrams Shell site contains a wider array of fuel contaminants, and these contaminants are present at higher concentrations.

A further discussion of the Charnock Sub-Basin groundwater characteristics will be included in the submittal for Task 4 for the joint agency SOW.

1.2 Treatment Goal Basis

Pilot and bench study work was accomplished by a number of different parties. The following describes the various studies and their treatment goals, if applicable.

1.2.1 Drinking Water

Several studies have been conducted using Charnock Sub-Basin groundwater to assess treatment of MtBE. Because the objectives and conditions of many of these studies varied, the data for the studies cannot always be correlated directly. The treatment goals for several studies are presented in Table 2.

1.2.2 Discharge to NPDES Connector

The Abrams Shell Site 11 remediation project discharges treated water under NPDES Permit No. CA0064289. The established maximum values or ranges are as follows:

- TPHg – 100 μg/l
- Benzene – 1 μg/l
- Toluene – 150 μg/l
- Ethylbenzene – 700 μg/l
- Xylenes – 1,750 μg/l
- MtBE – 13 μg/l
- tBA – 1,750 μg/l
- pH – 6.0-9.0

1.3 Report Organization

The information in this report is presented in the following order:

- Section 1: introduction and approach of the study
- Section 2: literature review
- Section 3: GAC technology study results
- Section 4: adsorptive resin treatment technology results
- Section 5: air stripping treatment technology study results
- Section 6: AOP treatment technology study results
- Section 7: representative block flow diagrams and mass balance results
- Section 8: references for this report
- Appendices A through M: bench-scale and pilot study reports relevant to the Charnock Sub-Basin groundwater.